



Implementing an Expressive Writing Intervention for Test Anxiety in a Large College Course[†]

Jennifer H. Doherty^{*‡} and Mary Pat Wenderoth[‡]
Department of Biology, University of Washington, Seattle, WA 98195

INTRODUCTION

Testing is a fact of life for college students, and an estimated 15 to 20% of our students experience high levels of test anxiety (1). Though some level of anxiety is productive, high levels negatively impact academic performance (2). As a result, test performance does not accurately measure the abilities of those students who experience high levels of test anxiety. Additionally, it appears that there are gender (3,4) and academic standing (high vs. low GPA) (5) differences in levels of test anxiety.

Test anxiety is defined as a negative response to an exam situation. These negative responses can manifest themselves both physically (e.g., increased heart rate, nausea) and cognitively (e.g., considering consequences of failure, comparing yourself to peers, lack of confidence or feeling unprepared; reviewed in 6). The mechanism proposed to explain the deleterious effect is that anxious thoughts take up resources in the limited space of working memory, thus diminishing cognitive capacity (7). This decrease may not hinder the student's ability to answer questions requiring the lower-order cognitive skills of recalling facts and definitions but does diminish the student's ability to solve more complex and intellectually challenging questions (8).

Multiple interventions have been developed for alleviating test anxiety. Interventions include training students to reappraise physiological symptoms as something positive (e.g., a faster heart rate delivers more oxygen to your brain; 9), to alter their test taking strategies (10), and to practice relaxation techniques (11). Ramirez and Beilock developed an intervention based on expressive writing (EW) that is particularly effective in decreasing the impact of test anxiety in a cognitive laboratory and a 9th-grade classroom (8). For the EW intervention, students write about their thoughts and feelings regarding the exam immediately preceding the

exam. Separately, it has been shown that when written-down thoughts are physically discarded (e.g., crumpling the paper and throwing it away), they are not as likely to impact a person's thoughts or actions (12). We investigated the feasibility of using a combined intervention of crumpling and throwing away EW in our large lecture course for science majors.

PROCEDURE

We implemented the EW intervention in our introductory biology course at an R1 university. The course enrolled 101 students, of whom five dropped. The majority of students were female (60%) and sophomores. Based on historical class survey results, over 50% of students self-report having test anxiety. This project complied with all relevant federal guidelines and institutional policies.

Prior to the first exam, we informed students that we were adding an optional expressive writing exercise at the start of exams. We explained why we were doing this by sharing the results of the Ramirez and Beilock study (8). Furthermore, we let the students know that their writing would be anonymous (no name on page) and that the length of the exam was shortened to accommodate the writing time.

On the day of the exam, students were reminded they had five minutes to complete the writing exercise. Exams were passed out and students had the option of completing the prompt (8; Appendix 1) found on the exam cover sheet. At the five-minute mark, students were instructed to rip off, crumple up, and throw the cover sheet into the aisle and begin the exam.

Though students could not start the exam early, they began crumpling and throwing their papers after only two minutes indicating they were clearly anxious (in every sense) to begin the exam. As all crumpled papers made it to an aisle, teaching assistants had no trouble collecting the crumpled responses. Crumpling and throwing papers in itself seemed to dissipate tension and created a more relaxed atmosphere in the classroom, as evidenced by laughing and the flight of paper airplanes.

A small percentage of students chose not to fully participate in the exercise, as some students threw blank pages and others did not throw their page (Table 1). Of the students who did take part in the exercise, we were quite surprised

^{*}Corresponding author. Mailing address: UW Biology, Box 351800, Seattle, WA 98195-1800. Phone: 206-616-4029. Fax: 206-685-1728. E-mail: doherty2@uw.edu.

Received: 13 February 2017, Accepted: 12 April 2017, Published: 11 August 2017.

[†]Supplemental materials available at <http://asmscience.org/jmbe>

[‡]These authors contributed equally to the manuscript.

TABLE 1.
Counts of student writing in mutually exclusive categories over time.

Category	Exam 1	Exam 2	Exam 3	Exam 4
Not collected	6	13	9	7
Blank	10	5	1	3
Drawings or verbal “doodling”	10	11	15	20
Course content or exam taking tips	2	8	12	13
Pep talks	19	26	22	31
Anxiety only	14	3	4	4
Anxiety with a pep talk	15	9	14	5
Anxiety with unpreparedness or negative consequences of failure	13	10	7	7
Vacillation among anxiety, pep talks, and unpreparedness or negative consequences of failure	12	13	13	6

by the variety of responses to the prompt. In an effort to better understand the range of feelings our students have concerning exams, we categorized the anonymous writings into eight mutually exclusive categories. To create categories, the two authors read and came to consensus as to how to categorize each response. The categories and two examples of responses from each category are presented in Table 2. In addition to those mutually exclusive categories, we counted how many times students mentioned course content or exam taking tips, prayed, or complained about exams or the course (Table 3).

Though we were surprised by the variation in student responses, we were even more surprised to see how the number of responses in each category changed over the course of the term. For instance, when students wrote about their feelings (excluding doodles and only course content), the proportion of pep talks increased while the proportion of writing with any mention of anxiety decreased (Cochran Armitage Exact Trend Test $p \leq 0.0007$). Possibly, as students became more familiar with course material and the exam format, they became less anxious. This explanation is also supported by the increase in references to course content and exam-taking tips observed. We were also heartened to see the number of complaints decline.

CONCLUSION

Given how easy it was to carry out the crumpling and throwing expressive writing exercise and the improved academic performance Ramirez and Beilock documented (8), we suggest instructors consider implementing this intervention. While we feel the exercise was relatively successful, we do note that students were not willing to write for the ten minutes employed in the Ramirez and Beilock study (8). As writings were anonymous, we also were not able to determine whether the exercise changed exam performance.

We think key elements to successful implementation of this exercise are explaining the goals of the exercise to the students prior to the exam, confirming the writing

time does not take away exam time, reminding students their writing is anonymous, and having students physically crumple and throw their writings away. Though our goal for implementing this exercise was to help anxious students perform better on exams, reading students' responses was equally valuable in providing us with insight into our students' feelings about exams and their coping mechanisms, which greatly improved our empathy toward our students. As a result, we now have added one more exam. This allowed us to decrease the number of questions per exam, thereby decreasing anxiety-producing time pressures.

SUPPLEMENTAL MATERIALS

Appendix I: Expressive writing prompt used

ACKNOWLEDGMENTS

We would like to thank the University of Washington Biology Education Research Group and Gerardo Ramirez for introducing us to the interventions. A preliminary version of this project was presented at SABER West at UC Irvine on January 14, 2017. The authors declare that there are no conflicts of interest.

REFERENCES

1. Hill KT, Wigfield A. 1984. Test anxiety: a major educational problem and what can be done about it. *Elem Sch J* 85:105–126.
2. Zeidner M. 1998. Test anxiety: the state of the art. Springer Science & Business Media, New York, NY.
3. Devine A, Fawcett K, Szűcs D, Dowker A. 2012. Gender differences in mathematics anxiety and the relation to mathematics performance while controlling for test anxiety. *Behav Brain Funct* 8:33.
4. Ganley CM, Vasilyeva M. 2014. The role of anxiety and working memory in gender differences in mathematics. *J Educ Psychol* 106:105–120.

TABLE 2.
Categories of student writing with examples.

Category	Examples
Drawings or verbal “doodling”	pickles pickles pickles pickles pickles (covering the whole page) [drawings of flowers]
Course content or exam taking tips	↑CO ₂ → ↑Rubisco → ↑Calvin cycle activity → ↑ATP and NADPH production → ↑Photosynthetic rate Sym NE; para Ach; Ca pump & NCX
Pep talks	Remember to work fast; Breathe Breathe; You studied hard for it and you know it; Good luck ! :-) This is the last one and I am going to <u>destroy</u> this exam! I've studied a lot for this exam. I did an amazing job in lab explaining the board work to my lab group. I have done my best all quarter and that's all that matters! I have successfully completed the Intro Bio series! This is the last exam in the series! I am so excited that I have completed this. I can do it. Just this exam and I am done! This test is going to be great!
Anxiety only	<u>Nervous</u> Feeling axious so anxious I didn't even spell it right the 1st time. Ha!
Anxiety with a pep talk	I usually don't get test taking anxiety for normal exams until right before the test. This time is no different. Mentally I feel prepared to the best of my ability, but I always physically feel anxiety. I am ready for this test. I did poorly on the last one, but I know I can do better b/c I studied more for this one! I am still a little nervous, but I know I will do fine.
Anxiety with unpreparedness or negative consequences of failure	I am terrified and annoyed because if I do bad I do not know if I will do well for the rest of the course due to experience. I guess it is all on faith now. I want a good future. I don't want to live in one that I can't do want I want to do. I'm soooooo freakin' stressed about this test. I really need to do well this quarter and I'm worried that I once again am letting personal stuff get in the way of my education. I miss being the smartest person in the room, but that's an asshole thing to say. I don't want to be a disappointment anymore than I already have.
Vacillation among anxiety, pep talks, and unpreparedness or negative consequences of failure	I feel like I should know this material better. I'm nervous that I will doubt my knowledge. I had to study harder but idk how. I really hope to do well. I need this for myself to motivate me. Hopefully it will all be fine. I know it will but I need ↑ 3.0. I can do this. My doubts about myself will be tested. I need to just read the questions better. I'm worried about the exam because I didn't do well in Bio 200 & I need to do well here for the major I'm interested in. That being said, I've studied a lot & feel prepared especially after going over the learning objectives. Desperation just isn't a fun feeling. Standardized testing is not my thing, and I rarely represent my knowledge when I take tests. I know that esp. at a huge uni they're necessary, but they're not my jam.

TABLE 3.
Counts of student writing that contained the non-mutually exclusive categories over time.

Category	Exam 1	Exam 2	Exam 3	Exam 4
Course content	10	11	18	23
Exam taking tips	2	5	10	10
Complaining about exams or course	9	2	1	1
Prayers	3	3	5	4

5. Chapell MS, Blanding ZB, Silverstein ME, Takahashi M, Newman B, Gubi A, McCann N. 2005. Test anxiety and academic performance in undergraduate and graduate students. *J Educ Psychol* 97:268–274.
6. Cassady JC, Johnson RE. 2002. Cognitive test anxiety and academic performance. *Contemp Educ Psychol* 27:270–295.

7. Moran TP. 2016. Anxiety and working memory capacity: a meta-analysis and narrative review. *Psychol Bull* 142:831–864.
8. Ramirez G, Beilock SL. 2011. Writing about testing worries boosts exam performance in the classroom. *Science* 331:211–213.
9. Jamieson JP, Peters BJ, Greenwood EJ, Altose AJ. 2016. Reappraising stress arousal improves performance and reduces evaluation anxiety in classroom exam situations. *Soc Psychol Personal Sci* 1948550616644656.
10. Damer DE, Melendres LT. 2011. “Tackling Test Anxiety”: a group for college students. *J Spec Group Work* 36:163–177.
11. Bruny  TT, Mahoney CR, Giles GE, Rapp DN, Taylor HA, Kanarek RB. 2013. Learning to relax: evaluating four brief interventions for overcoming the negative emotions accompanying math anxiety. *Learn Individ Differ* 27:1–7.
12. Bri ol P, Gasc  M, Petty RE, Horcajo J. 2013. Treating thoughts as material objects can increase or decrease their impact on evaluation. *Psychol Sci* 24:41–47.